Maharshi Dayanand University
Rohtak

Syllabus and Courses of Reading for
B.E. Electronics & Communication Engineering
Semester VII to VIII

Session - 2010-2011

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MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.E. IV Year Electronics & Communication Engineering
SEMESTER – VII
Modified 'E' Scheme effective from 2010-11

Course No.	Course Title	Teaching Schedule				Marks for Class Work	Examination Schedule (Marks)		Total Marks	Duration of Exam.
		L	T	P	Total		Theory	Practical		
EE-401-E 201-E	Data Commu-cation)	3	1	-	4	50	100	-	150	3
IC-403 E	Embedded Systems Design (EI, IC, EL)	3	1	-	4	50	100	-	150	3
EE-405 E	Optical Commu-nication Systems	3	1	-	4	50	100	-	150	3
EE-407 E	Digital Signal Processing (EL, EI, IC, EE)	3	1	-	4	50	100	-	150	3
	*Open Elective	4	-	-	4	50	100	-	150	3
EE-421-E	Data Commu-nication Lab (EL, EE)	-	-	2	2	25	-	25	50	3
IC-417 E	Embedded Systems Design Lab. (EI, IC, EL)	-	-	2	2	25	-	25	50	3
EE-427 E	Digital Signal Processing Lab. (EL, EI, IC, EE)	-	-	2	2	25	-	25	50	3
EE-431 E	Project	-	-	4	4	50	-	-	50	3
EE-435 E	Practical Training-II	-	-	2	2	-	-	-		-
	Total	16	4	12	32	375	500	75	950	

LIST OF OPEN ELECTIVES:

1 HUM-451-E Language Skills for Engineers
2 HUM-453-E Human Resource Management
3 HUM-457-E Business Communication
4 HUM-455-E Entrepreneurship
5 PHY-451-E Nano technology
6 PHY-453-E Laser Technology
7 ME-451-E Mechatronics Systems
8 CSE-451-E Artificial Intelligence & Expert Systems
9 CSE-303-E Computer Graphics
10 IC-455-E Intelligent Instrumentation for Engineers
11 IC-403-E Embedded Systems
12 CH-453-E Pollution & Control
13 IT-471-E Management Information System
14 IT-204-E Multimedia Technologies

NOTE:

1. Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.
2. *Student will be permitted to opt for any one elective run by the other departments. However, the departments will offer only those electives for which they have expertise. The choice of the students for any elective shall not be a binding for the department to offer, if the department does not have expertise.
3. Assessment of Practical Training-II, carried out at the end of VI semester, will be based on seminar, viva-voce and project report of the student from the industry. According to performance, letter Grades A, B, C, F are to be awarded. A student who is awarded 'F' grade is required to repeat Practical Training.
4. Project load will be treated as 2 hours per week for Project Coordinator and 1 hour for each participating teacher. Project will commence in VII semester where the students will identify the Project problem, complete the design/procure the material/ start the fabrication/complete the survey etc., depending upon the nature of the problem. Project will continue in VIII semester.

EE-401-E

DATA COMMUNICATION

L	T	P
3	1	-

Class Work : 50
Exam : 100
Total : 150
Duration of Exam : 3 Hrs.

Unit-1: **DIGITAL COMMUNICATION:** Introduction, digital communication, Shannon limit for information capacity, digital radio, digital amplitude modulation, frequency shift keying (FSK), phase shift keying (PSK), quadrature amplitude modulation (QAM), band width efficiency, carrier recovery, differential phase shift keying,(DPSK), clock recovery, probability of error & bit error rate, trellis encoding.

Unit-2: **DATA COMMUNICATIONS:** Introduction, history of data communication, standard organization for data communication, data communication circuits, data communication codes, error control, synchronization, data communications hardware, serial interfaces: RS-232, RS-449 & RS-530, CCITT X.21, parallel interfaces: centronics parallel interfaces. the telephone network: DDD network, private- line service, the telephone circuit, data modems: synchronous modems, asynchronous modems, modem synchronization.

Unit-3: **DATA COMMUNICATIONS PROTOCOLS AND NETWORK CONFIGURATIONS :** Introduction, open system interconnection (OSI), data transmission mode, asynchronous protocols, synchronous protocols, public data network, integrated services digital network (ISDN), local area networks, token pass ring, Ethernet.

Unit-4: **MULTIPLEXING :** Introduction, time division multiplexing, T1 digital carrier system, CCITT time division multiplexed carrier systems, CODECS, COMBO chips, line encoding, T-CARRIERS, frame synchronization, bit interleaving VS word interleaving,

frequency division multiplexing, AT&T's FDM hierarchy, composite base band signal, formation of a master group.

Unit-5: **INTERNET AND TCP/IP:** Introduction, history, use of Internet, accessing the Internet, Internet addresses, security on the internet, authentication, firewalls, intranet and extranet, TCP/IP reference model, domain name service, world wide web.

TEXT BOOK:

1. Electronic Communications Systems (4th Ed.) : Wayne Tomasi; Pearson
2. Data Communication and Networking (2nd -edition): Forauzan;

NOTE:
Eight questions are to be set at-least one from each unit. Students have to attempt any five questions

IC-403-E

EMBEDDED SYSTEM DESIGN

L	T	P
3	1	-

Class Work : 50
Exam : 100
Total : 150
Duration of Exam : 3 Hrs.

Unit-1: **INTRODUCTION :** Different types of microcontrollers: Embedded microcontrollers, External memory microcontrollers; Processor Architectures: Harvard V/S Princeton , CISC V/S RISC; microcontrollers memory types; microcontrollers features : clocking, i/o pins, interrupts, timers, peripherals.

Unit-2: **MICROCONTROLLER ARCHITECTURE :** Introduction to PIC microcontrollers, Architecture and pipelining, program memory considerations, Addressing modes, CPU registers, Instruction set, simple operations.

Unit-3: **INTERRUPTS AND I/O PORTS :** Interrupt logic, Timer2 scalar initialization, IntService Interrupt service routine, loop time subroutine, External interrupts and timers, Synchronous serial port module, Serial peripheral device, O/p port Expansion, I/p port expansion, UART.

Unit-4: **SOFTWARE :** Development tools/ environments, Assembly language programming style, Interpreters, High level languages, Intel hex format object files, Debugging.

Unit-5: **PROGRAMMING WITH MICROCONTROLLERS:** Arithmetic operations, Bit addressing, Loop control, Stack operation, Subroutines, RAM direct addressing, state machines, Oscillators, Timer Interrupts, Memory mapped I/O.

Unit-6: **DESINING USING MICROCONTROLLERS :** Music box, Mouse wheel turning, PWM motor control, Aircraft Demonstration, ultra sonic distance measuring, Temperature Sensor, Pressure Sensor, Magnetic Field Sensor.

TEXT BOOK:

1. Design with PIC Microcontrollers by John B. Peatman, Pearson.

REFERENCE BOOKS :

1. Programming and Customizing the 8051 Microcontroller : Predko ; TMH.
2. Designing Embedded Hardware : John Catsoulis ;SHROFF PUB. & DISTR. ND.
3. Programming Embedded Systems in C and C++ : Michael Barr; SHROFF PUB. & DISTR. ND.

EE-405-E

OPTICAL COMMUNICATION SYSTEMS

L	T	P
3	1	-

Class Work : 50
Exam : 100
Total : 150
Duration of Exam : 3 Hrs.

Unit-1: **INTRODUCTION TO OPTICAL COMMUNICATION SYSTEMS :** Electromagnetic spectrum used for optical communication, block diagram of optical communication system. Basics of transmission of light rays. Advantages of optical fiber communication.

Unit-2: **OPTICAL FIBERS:** Optical fibers structures and their types, fiber characteristics : attenuation, scattering, absorption, fiber bend loss, dispersion; fiber couplers and connectors

Unit-3: **LED LIGHT SOURCE :** Light emitting diode : recombination processes, the spectrum of recombination radiation, LED characteristics, internal quantum efficiency, external quantum efficiency, LED structure, lens coupling to fiber, behavior at high frequencies.

Unit-4: **LASER LIGHT SOURCE :** Basic principles of laser action in semi -conductors, optical gain, lasing threshold, laser structures and characteristics, laser to fiber coupling, comparison with LED source.

Unit-5: **AVALANCHE AND PIN PHOTODETECTORS:** Principles of optical detection, quantum efficiency, responsivity, general principles of PIN photodetector, intrinsic absorption, materials and designs for PIN photodiodes, impulse and frequency response of PIN photodiodes, noise in PIN Photodiodes, multiplication process, APD Design, APD bandwidth, APD noise.

TEXT BOOK:

Optical Fiber Communications: John M Senior; PHI.

REFERENCE BOOKS :

1. Optical Communication Systems : John Gowar; PHI.
2. Optical Fiber Communications : Gerd Keiser; TMH
3. Optical fiber Communication : Selvarajan, Kar, Srinivas; TMH.

NOTE:

Eight questions are to be set at least one question from each unit. Students have to attempt five question in all.

EE-407-E

DIGITAL SIGNAL PROCESSING

L	T	P
3	1	-

Class Work : 50
Exam : 100
Total : 150
Duration of Exam : 3 Hrs.

Unit-1: **DISCRETE-TIME SIGNALS:** Signal classifications, frequency domain representation, time domain representation, representation of sequences by Fourier transform, properties of Fourier transform, discrete time random signals, energy and power theorems.

Unit-2: **DISCRETE-TIME SYSTEMS :** Classification, properties, time invariant system, finite impulse Response (FIR) system, infinite impulse response (IIR) system.

Unit-3: **SAMPLING OF TIME SIGNALS:** Sampling theorem, application, frequency domain representation of sampling, reconstruction of band limited signal from its samples. discrete time processing of continuous time signals, changing the sampling rate using discrete time processing.

Unit-4: **Z-TRANSFORM :** Introduction, properties of the region of convergence, properties of the Z-transform, inversion of the Z-transform, applications of Z-transform.

Unit-5: **BASICS OF DIGITAL FILTERS :** Fundamentals of digital filtering, various types of digital filters, design techniques of digital filters : window technique for FIR, bi-linear transformation and backward difference methods for IIR filter design, analysis of finite word length effects in DSP, DSP algorithm implementation consideration. Applications of DSP.

Unit-6: **MULTIRATE DIGITAL SIGNAL PROCESSING:** Introduction to multirate digital signal processing, sampling rate conversion, filter structures, multistage decimator and interpolators, digital filter banks.

TEXT BOOKS :

1. Digital Signal Processing : Proakis and Manolakis; PHI
2. Digital Signal Processing: Salivahanan, Vallavaraj and Gnanapriya;TMH

REFERENCE BOOKS:

1. Digital Signal Processing: Alon V. Oppenhelm;PHI
2. Digital Signal processing(II-Edition): Mitra, TMH

NOTE:

Eight questions are to be set - at least one from each unit. Students have to attempt five questions.

EE-421-E

DATA COMMUNICATION LAB

L	T	P
-	-	2

Class Work : 25
Exam : 25
Total : 50
Duration of Exam : 3 Hrs.

LIST OF EXPERIMENTS:

1. To study different types of transmission media
2. To study Quadrature Phase Shift Keying Modulation.
3. To study Quadrature Amplitude Modulation.
4. To Study !6 Quadrature Amplitude Multiplexing.

5. To Study Serial Interface RS-232 and its applications.
6. To study the Parallel Interface Centronics and its applications.
7. To configure the modem of a computer.
8. To make inter-connections in cables for data communication in LAN.
9. To install LAN using Tree topology.
10. To install LAN using STAR topology.
11. To install LAN using Bus topology.
12. To install LAN using Token-Ring topology
13. To install WIN NT
14. To cofigure a HUB/Switch.

NOTE :
At least ten experiments have to be performed in the semester; At least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus .

IC –417-E

EMBEDED SYSTEM DESIGN LAB

L	T	P		
-	-	2	Class Work	: 25
			Exam	: 25
			Total	: 50
			Duration of Exam : 3 Hrs.	

8051 Micro Controller

1. Write an Assembly language Programme (ALP) to generate 10kHz square wave.
2. Write an ALP to generate 10 kHz frequency using interrupts.
3. Write an ALP to interface one Microcontroller with other wring serial/parallel communication.
4. Write an ALP for temperature & pressure measurement & to display on intelligent LCD display PIC Microcontroller

5. Write an ALP for PWM based speed control of motor .
6. Write an ALP for PWM based regulator of voltage.
7. Write an ALP to send/receive the data from an computer to MC through serial communication General
8. Study of Development tools/environment for Microcontroller Programme.
9. Develop an embedded system for traffic light controller using Micro controller
10. Develop an embedded system for the automatic motion of a car (Model of car) & Subsequent display on LCD using Microcontroller.

EE-427-E

DIGITAL SIGNAL PROCESSING LAB

L	T	P		
-	-	2	Class Work	: 25
			Exam	: 25
			Total	: 50
			Duration of Exam : 3 Hrs.	

LIST OF EXPERIMENTS:

Perform the experiments using MATLAB:

1. To represent basic signals (Unit step, unit impulse, ramp, exponential, sine and cosine).
2. To develop program for discrete convolution.
3. To develop program for discrete correlation.
4. To understand stability test.
5. To understand sampling theorem.
6. To design analog filter(low-pass, high pass, band-pass, band-stop).
7. To design digital IIR filters(low-pass, high pass, band-pass, band-stop).
8. To design FIR filters using windows technique.
9. To design a program to compare direct realization values of IIR digital filter.

10. To develop a program for computing parallel realization values of IIR digital filter.
11. To develop a program for computing cascade realization values of IIR digital filter
12. To develop a program for computing inverse Z-transform of a rational transfer function.]

NOTE:

At least ten experiments have to be performed in the semester; out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.E. IV Year Electronics & Communication Engineering
SEMESTER – VIII
Modified 'E' Scheme effective from 2010-11

Course No.	Course Title	Teaching Schedule				Marks for Class Work	Examination Schedule (Marks		Total Marks	Duration of Exam.
		L	T	P	Total		Theory	Practical		
EE-402 E 202-E	Wireless Communication (Common with VI Sem.-CSE,IT)	3	1	-	4	50	100	-	150	3
EE-404 E	Satellite Communication Engg.	3	1	-	4	50	100	-	150	3
	Deptt. Elective-I	4	-	-	4	50	100	-	150	3
	Deptt. Elective-II	4	-	-	4	50	100	-	150	3
EE-424 E	Satellite Communication Lab.	-	-	2	2	50	-	50	100	3
EE-431 E	Project	-	-	8	8	50	-	100	150	3
EE-422 E	Independent Study	-	-	4	4	50	-	-	50	
GFEE-202-E	General Fitness for the Profession	-	-	-	-	50	-	100	150	3
	Total	**14**	**2**	**14**	**30**	**400**	**400**	**250**	**1050**	

DEPT. ELECTIVE-I

EE-432E Mobile Communication

EE-317E Power Electronics

IC-404E Fuzzy Control System

(Common with EI, IC main paper in VIIIth sem)

DEPT. ELECTIVE-II

EE-462-E Genetic Algorithms & Applications

EE-454-E Radar and Sonar Engg.

EE-406-E Advance Control System

NOTE:

1. Project load will be treated as 2 hrs. per week for the project coordinator and 1 hour for each participating teacher. Project involving design, fabrication, testing, computer simulation,

case studies etc., which has been commenced by students in VII semester will be completed in VIII semester.

2. For the subject EE-422E (Independent Study Seminar), a student will select a topic from emerging areas of Electronics & Communication Engineering and study it thoroughly and independently. Later he will give a seminar talk on the topic.
3. A team consisting of Principal/Director, HOD of concerned department and external examiner appointed by University shall carry out the evaluation of the student for his/her General Fitness for the Profession.
4. Students will be allowed to use the non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

EE-402-E

WIRELESS COMMUNICATION

L	T	P
3	1	-

Class Work : 50
Exam : 100
Total : 150
Duration of Exam : 3 Hrs.

Unit-1: **INTRODUCTION TO WIRELESS COMMUNICATION SYSTEMS:** Evolution of mobile radio communications, examples of wireless comm. systems, paging systems, Cordless telephone systems, comparison of various wireless systems.

Unit-2: **MODERN WIRELESS COMMUNICATION SYSTEMS:** Second generation cellular networks, third generation wireless networks, wireless in local loop, wireless local area networks, Blue tooth and Personal Area networks.

Unit-3: **INTRODUCTION TO CELLULAR MOBILE SYSTEMS:** Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analog cellular systems, digital Cellular Systems.

Unit-4: **ELLULAR SYSTEM DESIGN FUNDAMENTALS:** Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity.

Unit-5: **MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION:** Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access, packet ratio, capacity of a cellular systems.

Unit-6: **WIRELESS NETWORKING:** Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission

hierarchy, traffic routing in wireless networks, wireless data services, common channel signaling, ISDN (Integrated Services digital Networks), advanced intelligent networks.

Unit-7: INTELLIGENT CELL CONCEPT AND APPLICATION: Intelligent cell concept, applications of intelligent micro-cell Systems, in-Building Communication, CDMA cellular Radio Networks.

TEXT BOOKS:

1. Wireless Communications: Theodore S. Rappaport; Pearsons.
2. Mobile Cellular Telecommunication: W.C.Y.Lee; McGraw Hill

REFERENCE BOOK:

1. Mobile Communications: Jochen Schiller; Pearson

NOTE:

Eight questions are to be set -one question from each unit. Students have to attempt any five question.

EE-404-E

SATELLITE COMMUNICATION

L	T	P
3	1	-

Class Work : 50
Exam : 100
Total : 150
Duration of Exam : 3 Hrs.

Unit-1: PRINCIPLES OF SATELLITE COMMUNICATION: Evolution & growth of communication satellite, Synchronous satellite, Satellite frequency allocation & Band spectrum, Advantages of satellite communication, Active & Passive satellite, Modem & Codec. Applications of satellite communication.

Unit-2: COMMUNICATION SATELLITE LINK DESIGN: Introduction, General link design equations, System noise temperature, C/N & G/T ratio, Atmospheric &

Ionospheric effects on link design, Complete link design, Earth station parameters.

Unit-3: ANALOG SATELLITE COMMUNICATION : Introduction, Baseband analog(Voice) signal, FDM techniques, S/N & C/N ratio in frequency modulation in satellite link, S/N ratio in FM with multiplexed telephone signal in satellite link, Single channel per carrier(SCPC) systems, Companded single sideband (CSSB) systems, Analog FM/FDM TV satellite link, Intermodulation products & their effects in FM/FDM systems, Energy disposal in FM/FDM systems.

Unit-4: DIGITAL SATELLITE COMMUNICATION : Advantages of digital communication, Elements of digital satellite communication systems, Digital baseband signals, Digital modulation techniques, Satellite digital link design, Time Division Multiplexing.

Unit-5: MULTIPLE ACCESS TECHNIQUES: Introduction, TDMA, TDMA-Frame structure, TDMA-Burst structure, TDMA-Frame efficiency, TDMA-superframe, TDMA-Frame acquisition & Synchronization, TDMA compared to FDMA, TDMA Burst Time Plan, Multiple Beam (Satellite switched) TDMA satellite system, Beam Hopping(Transponder Hopping) TDMA, CDMA & hybrid access techniques.

Unit-6: SATELLITE ORBITS: Introduction, Synchronous orbit, Orbital parameters, Satellite location with respect to earth, Look angles, Earth coverage & slant range, Eclipse effect, Satellite placement in geostationary orbit, station keeping, Satellite stabilization.

Unit-7: SPECIAL PURPOSE COMMUNICATION SATELLITES : BDS, INMARSAT, INTELSAT, VSAT(data broadband satellite), MSAT(Mobile Satellite Communication technique), Sarsat(Search & Rescue satellite) & LEOs (Lower earth orbit satellite), Satellite communication with respect to Fiber Optic Communication, LANDSAT, Defense satellite.

Unit-8: **LASER SATELLITE COMMUNICATION:** Introduction, Link analysis, Optical satellite link transmitter, Optical satellite link receiver, Satellite Beam Acquisition, Tracking & Positioning, Deep Space Optical Communication Link.

TEXT BOOK:

1. Satellite Communication : D.C. Aggarwal ; Khanna.

REFERENCE BOOK :

1. Satellite Communication :Gagliardi ; CBS

NOTE:

Eight questions are to be set - one question from each unit. Students have to attempt any five question.

EE-424-E

SATELLITE COMMUNICATION LAB

L	T	P
3	1	-

Class Work : 50
Exam : 100
Total : 150
Duration of Exam : 3 Hrs.

LIST OF EXPERIMENTS:

1. To set up a active and passive satellite communication link and study their difference.
2. To measure the base-band analog (voice) signal parameters in the satellite link.
3. To measure C/N ratio.
4. To transmit and receive the function generator waveforms through a Sat.Com. link.
5. To measure the digital baseband signal parameters in Sat.Com. link.
6. To send telecommand and receive the telemetry data.
7. To set a PC to PC Sat. Com. Link using RS-232 ports.

8. To measure the propagation delay of signal in a Sat. Com. Link.
9. To measure fading of a received signal.
10. To measure the parameters in an analog FM/FDM TV Sat.Com. link.
11. To measure the S/N ratio.
12. To calculate the figure of merit and FM deviation.

NOTE:

At least ten experiments are to be performed , atleast seven experiments are to be taken from the above list and the remaining three based on the syllabus of EE-404-C (Satellite Communication Engineering) be developed at the institution level. The students will be required to perform at least eight experiments in the semester.

EE-432-E

MOBILE COMMUNICATION

L	T	P
3	1	-

Class Work : 50
Exam : 100
Total : 150
Duration of Exam : 3 Hrs.

Unit-1: **MOBILE RADIO SYSTEM:** A reference model, Frequencies for radio transnussion, Signals, Antennas, Signal Propagation, Multiplexing. Modulation

Unit-2: **CHARACTERISTICS OF RADIO WAVES:** Multipath Characteristics of radio waves signal fading, time dispersion, Doppler spread, coherence time, LCR. fading statistics. Diversty techniques

Unit-3: **MOBILE RADIO PROPAGATION:** Mechanism, free space path loss, long distance path loss model, Okumara model, Hata model, PCS model, wideband PCS, Microcell model, Indoor propagation model, Jake's channel model.

Unit-4: **WIRELESS SYSTEMS:** Standards – GSM, signaling & call control, mobility management, location racking wireless data services IS-95, GPRS.

Unit-5: **WIRELESS DATA NETWORKING:** IEEE Standards, Models Different layers, wireless LAN, Hypes LAN, Blue tooth. Performance analysis of link & transport layer protocols over wireless channels.

Unit-6: **MOBILE NETWORK LAYER:** Mobile IP: Goals, assumptions & requirements, IP packet delivery, Agent discovery, Registration, tunneling and en capsulation, optimization, Reverse tunneling, IP-V6, Mobile ad-hoc networks.

Unit-7: **MOBILE TRANSPORT LAYS:** Tradition TCP, Classical TCP improvement, TCP over 2.5G/3G wireless networks. Performance enhancing proxies.

TEXT BOOKS:

1. Mobile Communication: II nd edition Jochen Schiller Pearson Education

REFERENCES:

1. Mobile Cellular Telecommunications: 2nd Edition: William, C Y Lee Mc Graw Hill
2. Wireless and Digital Communication: Dr. Kamilo Feher (PHI)
3. T.S. Rappaport, "Wireless Communication, Principles & Practice", PHI 2001.

NOTE:

Eight questions are to be set – at least one from each unit. Students have to attempt five questions.

EE-317-E

POWER ELECTRONICS

L	T	P			
3	1	-	Class Work	:	50
			Exam	:	100
			Total	:	150

Duration of Exam : 3 Hrs.

Unit-1: **INTRODUCTION :** Role of power electronics, review of construction and characteristics of power diode, Shottky diode, power transistor, power MOSFET, SCR, DIAC, Triac, GTO, IGBT & SIT.

Unit-2: **SCR:** Ratings and protections, series and parallel connections, R, RC and UJT firing circuit and other firing circuits based on ICs and microprocessors; pulse transformer and opto-coupler, commutation techniques.

Unit-3: **AC REGULATORS:** Types of regulator, equation of load current, calculation of extinction angle, output voltage equation, harmonics in load voltage and synchronous tap changer, three phase regulator.

Unit-4: **CONVERTERS :** One, two, three, six and twelve pulse converters, fully and half controlled converters, load voltage waveforms, output voltage equation, continuous and discontinuous modes of operation, input power factor of converter, reactive power demand, effect of source inductance, introduction to four quadrant / dual converter, power factor improvement techniques, forced commutated converter, MOSFET and transistor based converters.

Unit-5: **INVERTERS :** Basic circuit, 120 degree mode and 180 degree mode conduction schemes, modified McMurray half bridge and full bridge inverters, McMurray -Bedford half bridge and bridge inverters, brief description of parallel and series inverters, current source inverter (CSI), transistor and MOSFET based inverters.

Unit-6: **CHOPPERS :** Basic scheme, output voltage control techniques, one, two, and four quadrant choppers, step up chopper, voltage commutated chopper, current commutated chopper, MOSFET and transistor based choppers.

Unit-7: CYCLOCONVERTERS : Basic principle of frequency conversion, types of cycloconverter, non-circulating and circulating types of cycloconverters.

Unit-8: DRIVES: Introduction to electric drives: DC drives – converter and chopper fed dc drives, ac drives - stator voltage control, V/f control, rotor resistance control, static Scherbius system and static Kramer systems.

TEXT BOOK:

1. Power Electronics : MH Rashid; PHI

REFERENCE BOOKS :

1. Power Electronics : PC Sen; TMH
2. Power Electronics : HC Rai; Galgotia
3. Thyristorised Power Controllers : GK Dubey, PHI
4. Power Electronics and Introduction to Drives : A.K.Gupta and L.P.Singh;Dhanpat Rai
5. Power Electronics: P.S Bhimra.

NOTE :

Eight questions are to be set –one from each unit. Students have to attempt any five questions.

IC-404-E

FUZZZY CONTROL SYSTEM

L	T	P
3	1	-

Class Work : 50
Exam : 100
Total : 150
Duration of Exam : 3 Hrs.

Unit-1: INTRODUCTION: Fuzzy control from an industrial perspective, knowledge-based controllers, knowledge representation in KBC's.

Unit-2: THE MATHEMATICS OF FUZZY CONTROL: Vagueness, fuzzy logic versus probability theory, fuzzy

sets, their properties & operations on fuzzy sets, fuzzy relations & operations on fuzzy relations, the Extension Principle, Fuzzy propositions, The Compositional Rule of Inference, Different implications, Representing a set of rules.

Unit-3: FKBC DESIGN PARAMETERS: The PKBC architecture, choice of variables & content of rules, Derivation of rules, choice of membership functions, choice of scaling factors, choice of fuzzification procedure, choice of defuzzification procedure, comparison and evaluation of defuzzification methods.

Unit-4: NONLINEAR FUZZY CONTROL : The Control Problem, The FKBC as a Non-Linear Transfer Element, Types of FKBC such as PID-like FKBC, Sliding Mode FKBC, Sugeno FKBC.

Unit-5: ADAPTIVE FUZZY CONTROL: Design & Performance Evaluation, Approaches to Design such as membership function tuning using gradient descent, membership function tuning using performance criteria, the self-organizing controller, model based controller.

Unit-6: STABILITY OF FUZZY CONTROL SYSTEMS: The State space approach, Stability and robustness indices, input-output stability, circle criterion, the conicity criterion.

TEXT BOOK:

An Introduction to Fuzzy Control: D.,Driankov, H.Hellendoorn and M.Reinfrank.; Narosa.

REFERENCE BOOKS:

Fuzzy Control Systems : Abraham Kandel and Gideon Imngholz; Narosa

NOTE :
Eight question are to be set at least one from each unit. Students have to attempt five questions in all.

EE-462-E

GENETIC ALGORITHMS & APPLICATIONS

L	T	P			
4	-	-	Theory	:	100
			Class Work	:	50
			Total	:	150
			Duration of Exam : 3 Hrs.		

1. **Introduction:** Overview, History of evolutionary computation: Search spaces & fitness landscapes, elements of genetic algorithms, comparison of Gas and tradition search methods.

2. **Fundamental Concepts of Gas:** Typical examples to illustrate how Gas work. Simple computer exercises.

3. **Problem Solving Using Gas:** Evolving computer programs, data analysis & prediction, evolving neural networks, simple computer exercises.

4. **Implementation of Gas:** Suitability of GA for typical problems, encoding a problem for a GA, adapting the encoding, selection methods, Genetic operators, Parameters for Gas.

TEXT BOOKS:

1. Davis L,"Handbook of Genetic Algorithms
2. Goldberg D.E.,"Genetic Algorithms in Search optimization & Machine Learning."
3. Michalewiez, Z.,"Genetic Algorithms & Data Structures = Evolution Programs

NOTE:

8 questions are to be set –at least one from each unit. Students have to attempt any five questions in all .

EE-454-E

RADAR AND SONAR ENGINEERING

L	T	P			
3	1	-	Class Work	:	50
			Exam	:	100
			Total	:	150
			Duration of Exam : 3 Hrs.		

Unit-1: **INTRODUCTION TO RADAR:** Radar Block Diagram & operation, Radar Frequencies, Radar development, Application of Radar.

Unit-2: **RADAR EQUATION:** Simple form of Radar Equation, Prediction of Range performance, Minimum detectable signal, Receiver noise, Signal to Noise ratio, Transmitter Power, Pulse repetition frequency & range ambiguities, System losses, Propagation effects.

Unit-3: **CW & FREQUENCY MODULATED RADAR:** The Doppler effect, CW Radar, Frequency-modulated CW Radar, Multiple Frequency CW Radar.

Unit-4: **MTI & PULSE DOPPLER RADAR:** Introduction, Delay Line Cancellors, Multiple or staggered, Pulse repetition frequencies, range-Gated Doppler Filters, Digital Signal Processing, Other MTI delay line, Limitation of MTI performance, Noncoherent MTI, Pulse Doppler Radar, MTI from a moving platform.

Unit-5: **TRACKING RADAR:** Tracking with Radar, Sequential Lobbing, Conical Scan, Monopulse Tracking Radar, Tracking in range, Acquisition.

Unit-6: **RECEIVERS, DISPLAYS & DUPLEXERS :** Radar Receivers, Noise Figure, Mixer, Low-noise Front ends, Displays, Duplexer, Receiver protectors.

Unit-7: **INTRODUCTION TO SONAR**

TEXT BOOK:

1. Introduction to Radar Systems: Merrill I. Skolnik, ; MGH

REFERENCE BOOK:

1. Electronic Communication Systems : Kennedy; TMH

NOTE:

8 questions are to be set –at least one from each unit. Students have to attempt any five Questions.

EE-406-E

ADVANCED CONTROL SYSTEMS

L	T	P			
3	1	-	Theory	:	100
			Class Work	:	50
			Total	:	150
			Duration of Exam : 3 Hrs.		

Unit-1: **STATE VARIABLE TECHNIQUES:** State variable representation of systems by various methods. Solution of state equations-state transition matrix. Transfer function from state variable model. Controllability & observability of state variable model.

Unit-2: **SECOND ORDER SYSTEMS & STATE PLANE:** Phase portrait of linear second systems. Method of isoclines, phase portrait of second order system with non-linearities, limit cycle, singular points.

Unit-3: **DESCRIBING FUNCTION ANALYSIS:** Definition, limitations, use of describing function for stability analysis , describing function of ideal relay, relay with hysteresis & dead zone, saturation/coulomb friction & backlash,

Unit-4: **LINEAR APPROXIMATION OF NONLINEAR SYSTEMS:** Taylor series, Liapunov's 2nd method.

Unit-5: **SAMPLED DATA SYSTEMS:** Sampling process, impulse modulation, mathematical analysis of sampling process, application of Laplace transform, Shannon's

theorem, reconstruction of sampled signal zero order & first order hold, Z-transform, definition, evaluation of Z-transform, Inverse Z-transform, pulse transfer function, limitations of Z-transform, state variable formulation of discrete time systems. Solution of discrete time state equations, stability, definition, the Schur-Cohn stability criterion, Jury's test of stability of extension of Routh-Hurwitz criterion to discrete time systems.

TEXT BOOKS:

1. Digital Control & State Variable Methods : M.Gopal ; TMH.

REFERENCE BOOKS :

1. Modern Control Theory : M.Gopal ; Wiley International.
2. Discrete Slotine & W.P.Li; Prentice Hall, USA,
3. Digital Control Systems : B.C.Kuo
4. Applied non-linear control : J.E.
5. Nonlinear Control Systems: Isidari ; Springer-Verlag.

NOTE :

8 questions are to be set –one from each unit. Students have to attempt five questions.time control system : K.Ogate ; PHI